CREST – GENES - ENSAI
Cours doctoraux 2023 – 2024

INTRODUCTION TO TOPOLOGICAL DATA ANALYSIS

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SCHEDULE	Tuesday	4th June 2024	From 2pm to 5pm	TBD
	Wednesday	5h June 2024	From 2pm to 5pm	TBD

Summary

With the recent explosion in the amount, the variety and the dimensionality of available data, identifying, extracting and exploiting their underlying structure has become a problem of fundamental importance for data analysis and statistical learning. Topological Data Analysis (TDA) is a recent field whose aim is to uncover, understand and exploit the topological and geometric structure underlying complex and possibly high dimensional data. It proposes new well-founded mathematical theories and computational tools that can be used independently or in combination with other data analysis and statistical learning techniques.

Outline

1. Persistent homology: an introduction (simplicial complexes, filtrations, homology,...).

2. Mapper, a topological tool for data exploration and visualization.

3. Applications of persistent homology in TDA: clustering, topological signatures, statistical aspects, TDA + Deep Learning

No specific background in topology is required to follow the course. Practical sessions (with Python, Jupyter Lab and Gudhi library) will be organized to illustrate the concepts and help the audience to become familiar with the tools of TDA.